Renewable Energy for Hawaii

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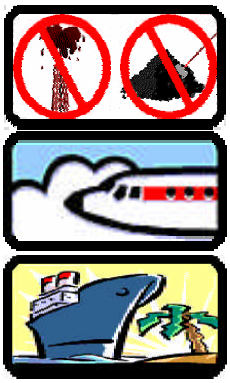
(www.state.hi.us/dbedt/ert)

Hawaii's Energy Situation

Assets

Challenges



Hawaii's energy challenges and opportunities are unique.

Resources

Hawaii has abundant natural resources:

- Sun;
- Wind;
- Biomass;
- Some (natural) streams for hydropower;
- Geothermal energy; and even
- Ocean and wave energy

Use of these resources is constrained by:

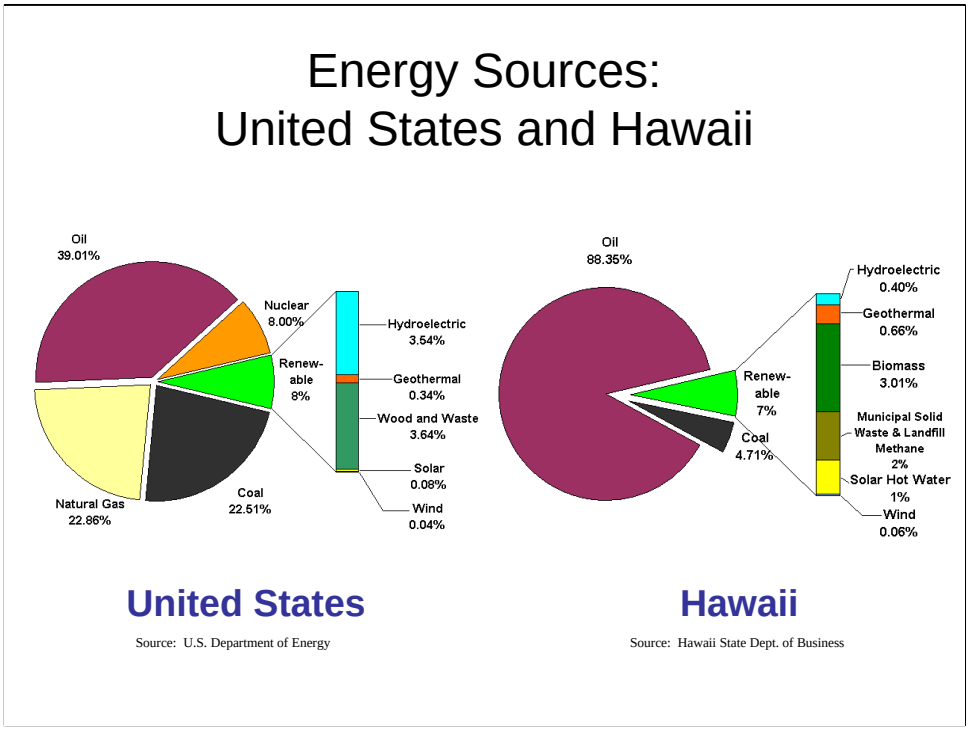
- Cost;
- Environmental impact,
- Aesthetic concerns; and
- Religious and cultural concerns.

Hawaii has no fossil fuel resources.

Logistics

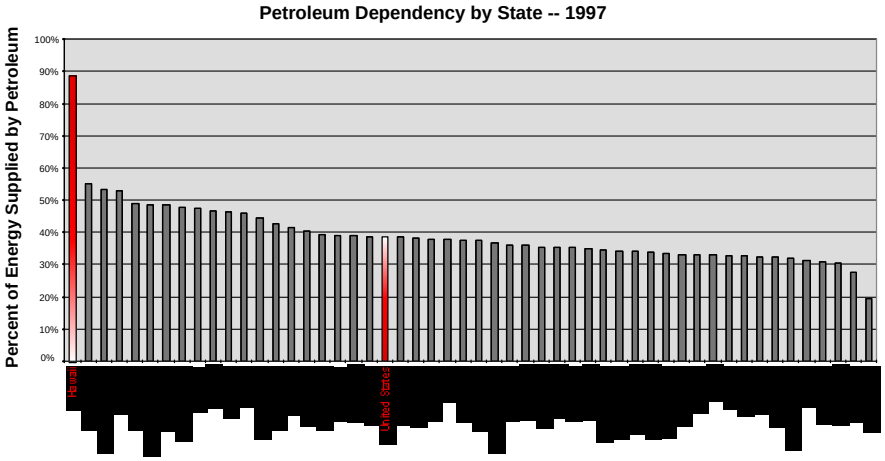
The state's nearest neighbor is 2500 miles away.

And, within the state, the utilities are NOT interconnected -- Each island has its own utility grid.



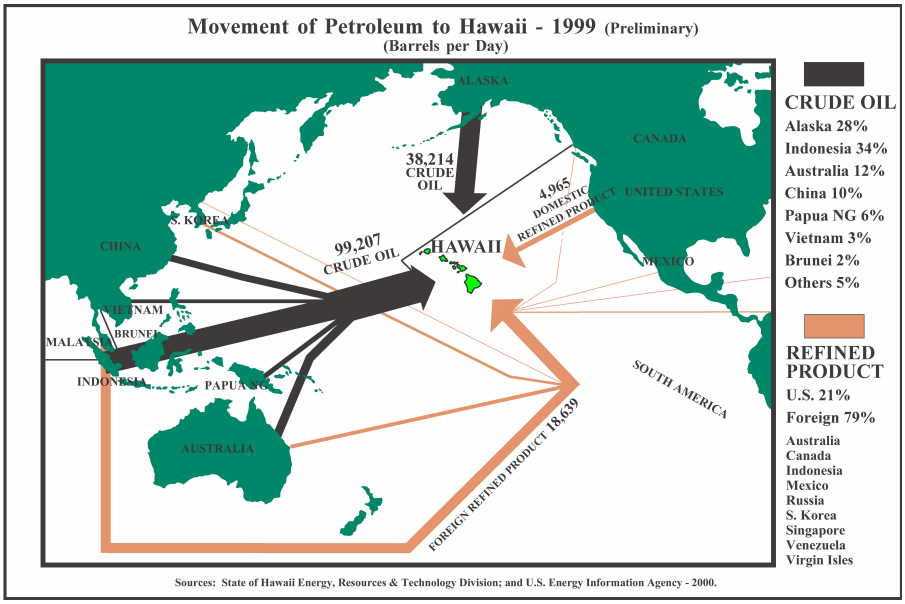
Data for 1999. This is similar to the information presented earlier by HECO. Does anyone know what the difference is? (Answer: HECO's showed the pie charts for ELECTRICITY sources. These pie charts are for all energy, including transportation fuels.)

Hawaii's Petroleum Dependence: Highest in the USA



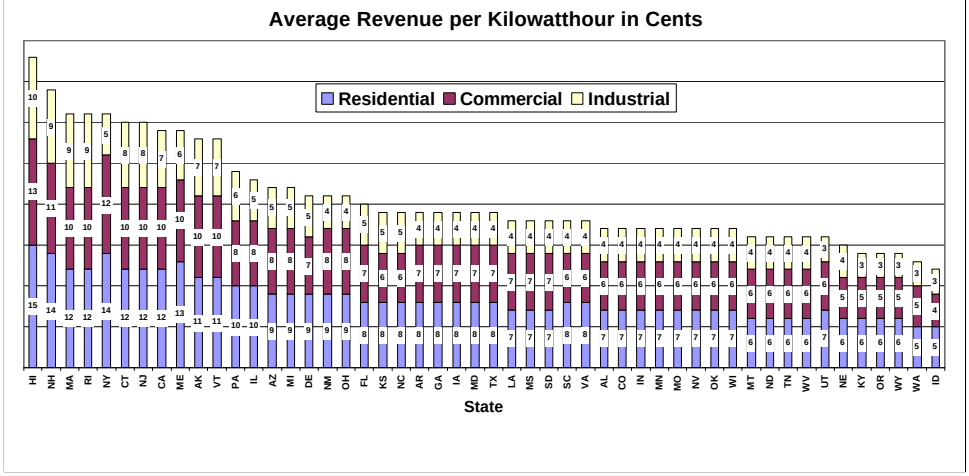
The State of Hawaii, typical of many islands, finds itself in a paradoxical energy situation. Despite its wealth of renewable energy resources and a twenty-year supportive state policy for energy efficiency, the State continues to rely heavily on imported oil and coal for almost 90 percent of its energy needs.

Movement of Petroleum to Hawaii



Hawaii's fuels come from all over the Pacific. This map shows from where. The amount from Alaska has been declining, as we projected several years ago. If the demand for petroleum increases in developing nations in Asia, as is being predicted, we will eventually be relying on oil from the Middle East.

Hawaii's Electricity Costs are Relatively High



Hawaii's electricity costs are relatively high. This graph shows average revenue per kWh for sales to residential, commercial, and industrial customers. The recent California situation is not shown.

Over the past ten years, the average electricity cost has risen 51%.

Rising oil prices do not help.

Increased use of renewable energy could help to mitigate the effects of oil market fluctuations.

Speaking of economics...

Maintaining a clean environment is important to Hawaii's economy

Tourism is Hawaii's largest economic activity

There is public support for sustainable development

Therefore, both environmentalists and business have expressed support for a "sustainable" approach to development.

So, the challenges and opportunities that face Hawaii have led to the formation of these energy objectives:

Hawaii's Energy Objectives

1. Dependable, efficient, and economical statewide energy systems capable of supporting the people's needs;
2. Increased energy self-sufficiency where the ratio of indigenous energy use to imported energy use is increased;
3. Greater energy security in the face of threats to Hawaii's energy supplies and systems;
4. Avoid, reduce, or sequester greenhouse gas emissions that contribute to global climate change.

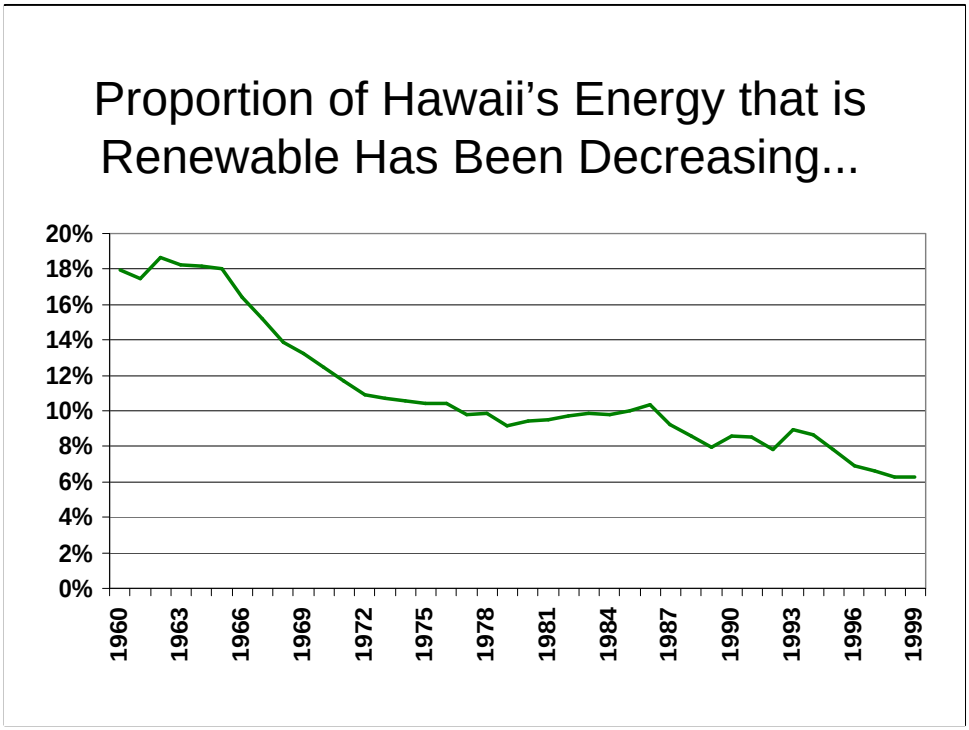
The increased use of renewable energy supports all four of these objectives.

Objective number 2 explicitly calls for the use of "indigenous,"or locally-available, energy sources, i.e. renewable energy.

Objective number 3 recognizes that overdependence on petroleum exposes Hawaii to risks from price spikes, supply interruptions, even shipping strikes.

The fourth objective is a new one, added last year. I'll show one more slide on this topic at the end.

So, with renewable energy such an important part of the State's energy policy, how are we doing?

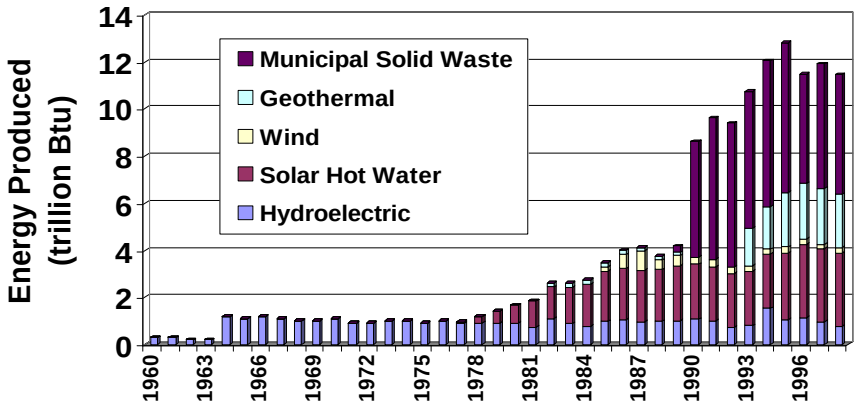


How are we doing? Not too well. The proportion of Hawaii's energy that is renewable has been decreasing…

… Largely Due to Sugar Plantation Closings.

…largely due to sugar plantation closings. Biomass is the largest source of renewable energy, and much of it was produced by the sugar companies.

However, the Amount of Energy Produced by Non-Biomass Renewable Sources Has Increased



If you take out all the biomass - pretend that Hawaii never had all that biomass - then we could say that the use of renewable energy has been increasing.

Shown on the graph (bottom to top):

Hydropower

Solar hot water

Wind

Geothermal

Municipal Solid Waste

So, we have been getting new renewables on-line. They just haven't been coming on fast enough to make up for the lost biomass.

Renewable Energy in Hawaii

Existing

- **162 MW biomass** (capability) (fuels used include biomass, MSW, landfill gas, oil, and coal)
- **32 MW hydroelectric**
- **30 MW geothermal**
- **11 MW wind**
- **0.6 MW on-grid PV systems**
- **~70,000 solar water heaters**
- **~3000 off-grid PV systems**
- **200,000 gallons per year biodiesel**

Planned

- **Installation of solar water heaters to continue**
- **35 MW wind (new)**
- **9 MW wind (repowering)**
- **30 MW geothermal (expansion)**
- **10 million gallons per year ethanol**

Here is where we stand today on renewables.

The biomass plants include sugar, MSW, and landfill methane plants. The sugar plants sometimes supplement their bagasse fuel with oil or coal; in the case of closed sugar plantations, biomass is no longer available and oil or coal are used.

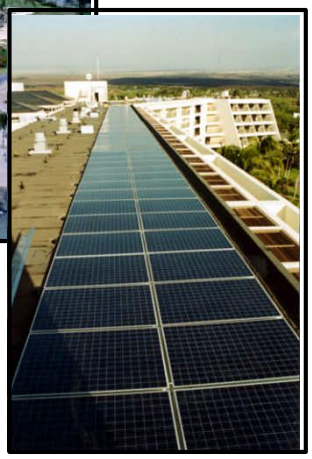
Planned projects include solar, wind, geothermal, and ethanol.

Federal Agencies Install Thousands of Solar Water Heaters in Hawaii

To date, Hawaii Federal facilities have installed 1,448 solar roofs, with another 1,000 being planned.

Of these, 1,350 solar water heating systems have been installed on Navy Family Housing units.

Other participating Hawaii Federal agencies include the U.S. Air Force, the U.S. Coast Guard, the National Parks Service and the National Weather Service.



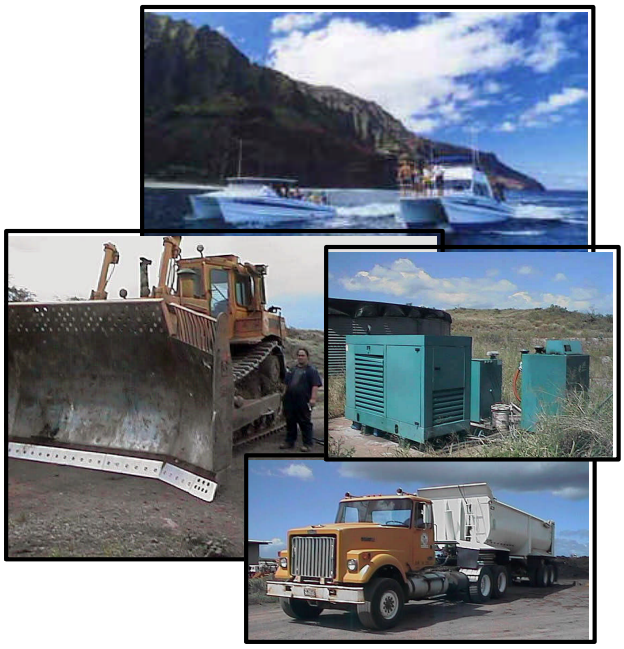
Mauna Lani's Rooftop Photovoltaic System by PowerLight Corp.

Bioplantations and Biorefineries offer long-term substitutes to petroleum.

Eucalyptus at Bioenergy's former Big Island plot.

Alternative Transportation Fuels Also Encouraged

- Biodiesel
- Ethanol Investment Credit
  - Equivalent to 30¢ per gallon production credit
- Electric Vehicle Incentives
  - Free registration; special plates; free parking; use of HOV lanes; rapid chargers

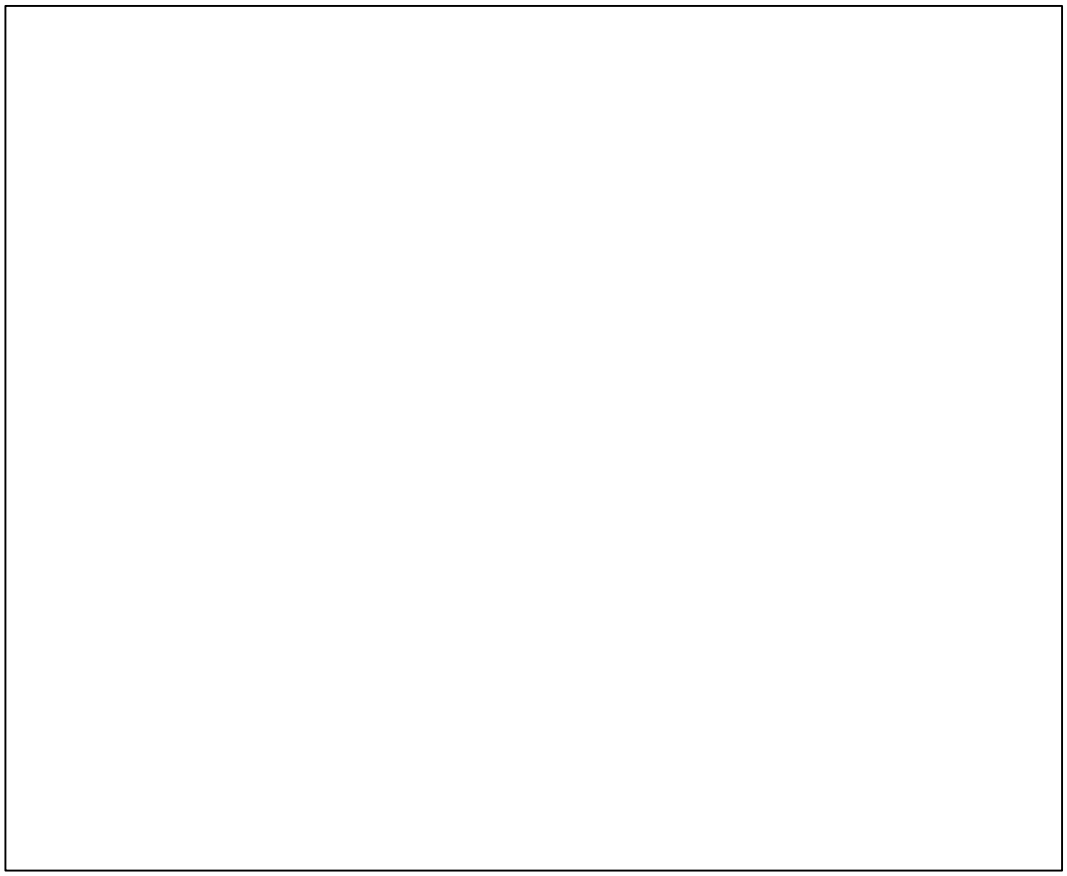


Pacific Biodiesel makes fuel from waste cooking oil on Maui.

Biodiesel is used in boats, bulldozers, gensets, and trucks.

State Commitment to Renewable Energy

- Tax credits
  - 35% for solar (up to a limit of $1750 for single-family residential units; no limit for commercial applications)
  - 20% for wind energy systems and heat pump water heaters.
  - 30 cents per gallon for ethanol
- State-funded resource assessments
  - Assessments provide data for renewable energy project developers, reducing up-front costs and data gathering time.
- Integrated Resources Planning (IRP)
  - Utilities are required to evaluate renewables for inclusion in future plans.
  - However, utility electricity generation plans still show almost 100% reliance on fossil fuels.
  - Utility IRP plans do include solar water heating, green pricing, and on- and off-grid PV programs.



State Commitment to Renewable Energy

- Education
  - Renewable energy curricula was developed previously and is still in use in many schools.
  - The “Sun Power for Schools” program includes a curriculum development component.
  - High school and community college involvement in solar events, electric vehicle competitions, and similar activities:
    - Increases awareness of new technologies, including renewable energy
    - Increases local technological skills and knowledge base
- Information Dissemination
  - Renewable energy information is kept available through printed publications, Internet site, workshops, etc.
  - Cooperative efforts with utilities, community organizations, etc.

Global Climate Change

Hawaii is a participant in the "State and Local Climate Change Program" of the U.S. Environmental Protection Agency

And last but not least, Hawaii is concerned about the possible ramifications of global climate change.

Hawaii is a participant in the Environmental Protection Agency's Climate Change Mitigation project.

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A Hawaii Climate Change Action Team was created in May 1999. Participants include:

- Department of Business, Economic Development, and Tourism (energy emissions)
- Department of Health (non-energy emissions)
- Department of Land and Natural Resources (carbon offset forestry)
- Hawaii Forestry Industry Association

Expansion Planned

- Office of Planning and State Civil Defense - adaptation
- Department of Agriculture - agricultural sources
- Department of Transportation - transportation energy
- Citizen and corporate stakeholders

Summary

- Hawaii's electricity costs are relatively high, and have been rising.
- State policy calls for increasing the use of renewable energy.
- Federal agencies have successfully deployed a number of renewable energy systems.
- A variety of renewable energy sources are available.
- Several State initiatives - ranging from tax credits to education programs - have supported the development and use of renewable energy.
- Increased use of renewable energy would support energy, economic, environmental, and security objectives.

A L O H A